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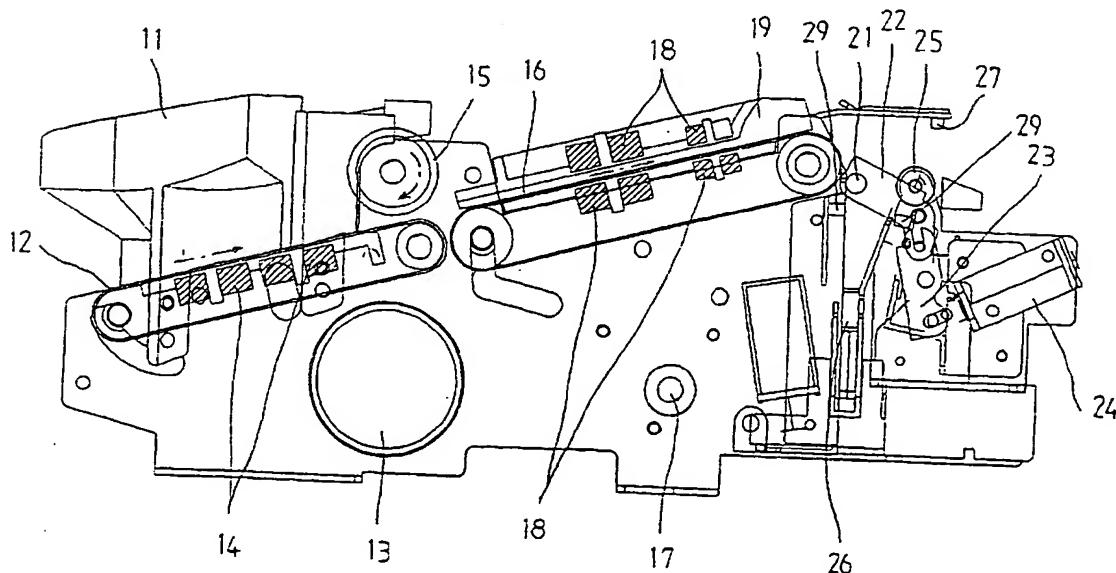
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### (54) Coin discriminator

(57) This invention is developed for the purpose of aligning multiple kinds of thrown-into coins and distinguishing the authenticity and money type of each coin, rejecting a counterfeit coin and receiving an authentic coin and is used for distributing the authentic coin to each money type. This invention provides a coin discriminator comprising at least: means for separating a

plurality of coins one by one; means being mounted on the separating means for distinguishing the coin separated; and means for receiving an authentic coin, which is a separated coin detected as being genuine by the means for distinguishing.

Figure 2



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## Description

[0001] This invention relates to an apparatus for distinguishing electronically coins.

[0002] Especially, this invention relates to a coin discriminator, in particular a throw-into-type coin discriminator for distinguishing several kinds of thrown-into coins.

[0003] Specifically, this invention relates to a throw-into-type coin discriminator which is suitable for such apparatuses that distinguish multiple kinds of thrown-into coins and distribute them according to the type of money to provide changes.

[0004] Further, the term coins means currency coins, but special coins such as medals and tokens may also be included in the term 'coin' which is used in the specification.

[0005] In prior art, various types of throw-into-type coin discriminators have been developed.

[0006] An example is disclosed in the specification of Japanese Patent Application 8-174064 (see JP-A-9-319913) by this applicant.

[0007] In the throw-into-type coin discriminator as shown in Fig. 6, multiple kinds of coins are fed into a hopper 9 of trumpet shape.

[0008] These coins pass through a long hole opened in the bottom of hopper 9, and are conveyed out of the hopper 9 by a first endless flat belt.

[0009] The width of said long hole is formed in consideration of the diameter of the largest coin to be handled, for example a 500 yen coin.

[0010] Therefore, multiple kinds of coins will be conveyed in a row.

[0011] A plurality of coins conveyed in a row is levelled so that there may be no overlap by an inverse roller 13 which rotates such that its part confronting said first belt moves reverse to the progress direction of the upper part of said first flat belt.

[0012] In addition, the plurality of coins flattened (levelled into one plane) in a row are conveyed out of the hopper 9 by a second endless flat belt 7.

[0013] Since this second flat belt 7 is faster than the velocity of said first flat belt, the plurality of coins which are flattened in a row are conveyed one by one apart from each other in a row.

[0014] Therefore, the coin pieces which drop from the flat belt 7 one by one are thrown into a coin selector 20 through the slot hole 27, which is installed in a substantially standing-up condition.

[0015] An inserted coin drops inside the selector 20 according to its weight, and the type and authenticity of said coin is judged electronically. Fig. 6 shows only a part of the selector 20.

[0016] The coin which is sent out from the selector 20 by dropping caused by its weight will ride on a long rail 31 in a standing-up condition.

## [PROBLEM ADDRESSED)

[0017] This invention is developed for the purpose of providing an improved coin discriminator integrating functions to distinguish the authenticity and type of coins, and to receive an authentic coin and to reject a counterfeit coin previous to the step of distributing authentic coins according to the money type.

[0018] This object is achieved by a coin discriminator according to claim 1.

[0019] In particular, the coin discriminator allows to integrate the functions with a much lower space requirement than in the prior art.

[0020] Further developments are given in the dependent claims.

[0021] For instance, the combination of the means for separating, e.g. the belt 16, the means for distinguishing, e.g. the sensors etc., and the means 21, etc. for receiving an authentic coin provides the improvement for thrown-into coins.

[0022] Hereinafter an embodiment of this invention is explained referring to the appended drawings, of which:

Fig. 1 is a sketchy plan view of one embodiment according to this invention;

Fig. 2 is a sketchy sectional view as if Fig. 1 was observed from the front;

Fig. 3 is a front sectional view showing a usual operation condition of the embodiment of Fig. 2;

Fig. 4 is a front sectional view showing another operation condition of the embodiment of Fig. 2;

Fig. 5 is a side view as if Fig. 4 was observed from the right; and

Fig. 6 is a perspective view showing a prior art example.

[0023] A throw-into-type coin discriminator shown in the drawings is constructed as follows.

[0024] The main body is a little large and is formed in the shape of a long box. On the left of said long box shape, a hopper 11 of schematic U-shape is formed. And a plurality of coins are thrown into the hopper 11.

[0025] A first endless belt 12 with large width is tensioned in the bottom of hopper 11 of substantial U-shape. The thrown-into coins usually are conveyed rightward in the drawings.

[0026] In addition, although the detailed structure of first belt 12 was omitted, it is rotated by a motor 13 which is capable of normal and reverse rotations.

[0027] Moreover, two sensors 14 for coin or metal are arranged under the coin conveying surface of first belt 12 (see Fig. 2).

[0028] That is, if a coin is thrown into the hopper 11, anyone of two sensors 14 will detect the coin and will output a start signal. The motor 13 starts by this start signal, and as the result,

[0029] the first belt 12 is actuated and the coin will be conveyed rightward in the drawings. In addition, a part

of the edge 11A of the lower aperture of hopper 11 forms a guide which is slanting to the progress direction of first belt 12, and puts the coins in a row, as the result.

[0030] On the upper-part center of the coin discriminator, i.e., on the right-end part of belt 12, a reverse roller 15 is arranged. The reverse roller 15 rotates such that its part confronting said first belt moves reverse to the progress direction of the upper part of said first flat belt. This roller 15 breaks down coins overlapped on the first belt 12 and puts the coins in a row and a sheet.

[0031] Near the right side upper part of coin discriminator, i.e., near the right end of the first belt 12, a second endless belt 16 with a large width is tensioned, and the coins are conveyed rightward in the drawings.

[0032] In addition, the second belt 16 is rotated in normal direction by a motor 17, although the detailed structure explanation is omitted.

[0033] Still, the velocity of the second belt 16 is faster than the velocity of the first belt 12. As a result, the coins which are in a row and a sheet on first belt 12 are separated one by one.

[0034] Under the coin conveying surface of the second belt 16, one side of four coin discrimination sensors 18 are arranged in 4 pieces.

[0035] And the other side of the discrimination sensors 18 are arranged in 4 pieces in a cover 19 of the second belt 16 (see Figs. 1 and 2).

[0036] These four discrimination sensors 18 are provided for distinguishing the diameter, thickness, and at least two kinds of materials such as for instance two metals of a coin.

[0037] A diagonal reference line 20 is formed above the upper surface of the second belt 16. The reference line 20 guides the coin which is moved and said coin is approached to the four discrimination sensors 18.

[0038] The reference line 20 is provided, for example, by a staggered groove (not shown) formed on the interior of cover 19.

[0039] Near the right end of the second belt 16, a long and slender selection roller 21 is arranged. This selection roller 21 is operated dependent on a detection whether the coin is genuine or not. It is operated by a solenoid 24 by means of a pivoted arm 22 and a pivoted link 23. Therefore, the selection roller 21 need not to be a roller, and may be in another form which can guide an authentic coin.

[0040] At the right-hand side of selection roller 21, a little thick sending roller 25 is arranged. This sending roller 25 sends out the coin further to the right-hand side when the coin is genuine.

[0041] In addition, when the coin is counterfeit, it becomes a stop body. Under the selection roller 21, a rejection board 26 (see Fig. 5) for counterfeit coins is diagonally arranged.

[0042] The rejection board 26 is usually projected as shown in the drawings, and is drawn into the apparatus by a solenoid (not shown), at the time of necessity.

[0043] In addition, at the upper and lower positions

near the sending roller 25, two sets of sensors 27 for detecting the passage of an authentic coin are arranged.

[0044] Moreover, two sets of sensors 29 for detecting the passage of a counterfeit coin are arranged at the right and left positions under the sending roller 25. The sensors 27 and 29 have two sets, respectively. Therefore, a passage of perforated coin, for example, 5 yen coin or 50 yen coin, is detected correctly by means of two output light beams. In other words, in the case of a perforation coin, since two pulses may be out-putted, this is compensated with another beam.

[0045] This embodiment which consists of an above-mentioned constituents is operated as follows. Firstly, a multiple variety of coins are fed into the hopper 11 of trumpet type. When the coins are fed into the hopper 11, the movement of first belt 12 is started, and the coins will be conveyed in a row by the open edge 11A.

[0046] And the several kinds of coins conveyed in a row are levelled by the roller 15 which is rotated such that its part confronting the belt 12 moves reverse to the progress direction of the upper part of first belt 12. The several kinds of coins levelled in a row are conveyed by said second endless belt 16.

[0047] Since this second belt 16 is quicker than the velocity of the first belt 12, the several kinds of coins levelled in a row will be separated from each other in the row one by one, and will be further conveyed. The multiple variety of coins conveyed apart from each other in the row one by one are guided by the diagonal reference line 20 and pass through the four discrimination sensors 18. Thus, the multiple variety of coins fed into the hopper 11 pass through the four discrimination sensors 18 one by one. And the authenticity and money type of each coin is judged one by one. When the coin which passed the discrimination sensors 18 is genuine, as shown in Fig. 3, the solenoid 24 is operated and the selection roller 21 is shifted a little to the right-hand side in the drawings, i.e. into the passage to the rejection board 26.

[0048] In this way, the coin C conveyed by the second belt 16 will be raised or kept up by the selection roller 21. The coin C raised with the selection roller 21 is further sent rightward in the drawings, by means of the sending roller 25. When the coin which passed the discrimination sensors 18 is a dummy, as shown in Fig. 4, the solenoid 24 is not operated and the selection roller 21 does not move. Therefore, the counterfeit coin C conveyed with the belt 16 will drop without reaching the sending roller 25.

[0049] The counterfeit coin C which is dropped is guided and collides at the slanting rejection board 26 in the standing up state, and will be sent out to the right-hand side, as shown in Fig. 5. In addition, even if the coin which passed the discrimination sensors 18 is genuine, but the coin is not to be sent out rightward as shown in Fig. 3, for example, the coin may be guided into a spare cash box, etc.. In this case, the solenoid 24

is not operated as shown in Fig. 4, and further a solenoid (not shown) of the rejection board 26 is operated and the rejection board 26 is withdrawn.

[0050] Thus, the authentic coin C conveyed with the belt 16 will drop without reaching the sending roller 25. 5

[0051] The authentic coin C which was dropped is guided in standing-up condition will pass the normal position of the rejection board 26 which was withdrawn. As shown at the broken line of Fig. 5, the coin collides with an inclined surface 28 below the normal position of the rejection board and will be sent out to the left-hand side. 10

#### [EFFECT OF THE INVENTION]

[0052] This invention as mentioned-above can align several kinds of inserted coins, and further the authenticity and money type of each coin can be distinguished with much lower space requirements than in the prior art. 15

[0053] Especially, this invention rejects a counterfeit coin in the process of coin discrimination, and the large effect that only an authentic coin can be received is obtained. 20

#### Claims

##### 1. A coin discriminator comprising at least:

means (11, 12, 15, 16) for separating a plurality of coins one by one; 30  
 means (18, 20), being mounted on the separating means, for distinguishing the separated coins; and  
 means (21, 24, 25) for receiving an authentic coin, which is a separated coin detected as being genuine by the means for distinguishing. 35

##### 2. The coin discriminator according to claim 1, which is of the throw-into-type, and wherein the separating means (11, 12, 15, 16) comprises 40

means (11, 12, 15) for arranging a plurality of thrown-into coins in a row, and  
 means (16) for separating the plurality of coins 45 arranged in a row one by one.

##### 3. The coin discriminator as described in claim 1 or 2, wherein the means for receiving an authentic coin includes a roller means (21). 50

##### 4. The coin discriminator as described in one of claims 1 to 3, wherein the means for distinguishing has means (20) for guiding the separated coins to the means (18) for distinguishing. 55

##### 5. The coin discriminator as described in one of claims 1 to 4, wherein the means for receiving an

authentic coin includes a solenoid means (24).

Figure 1

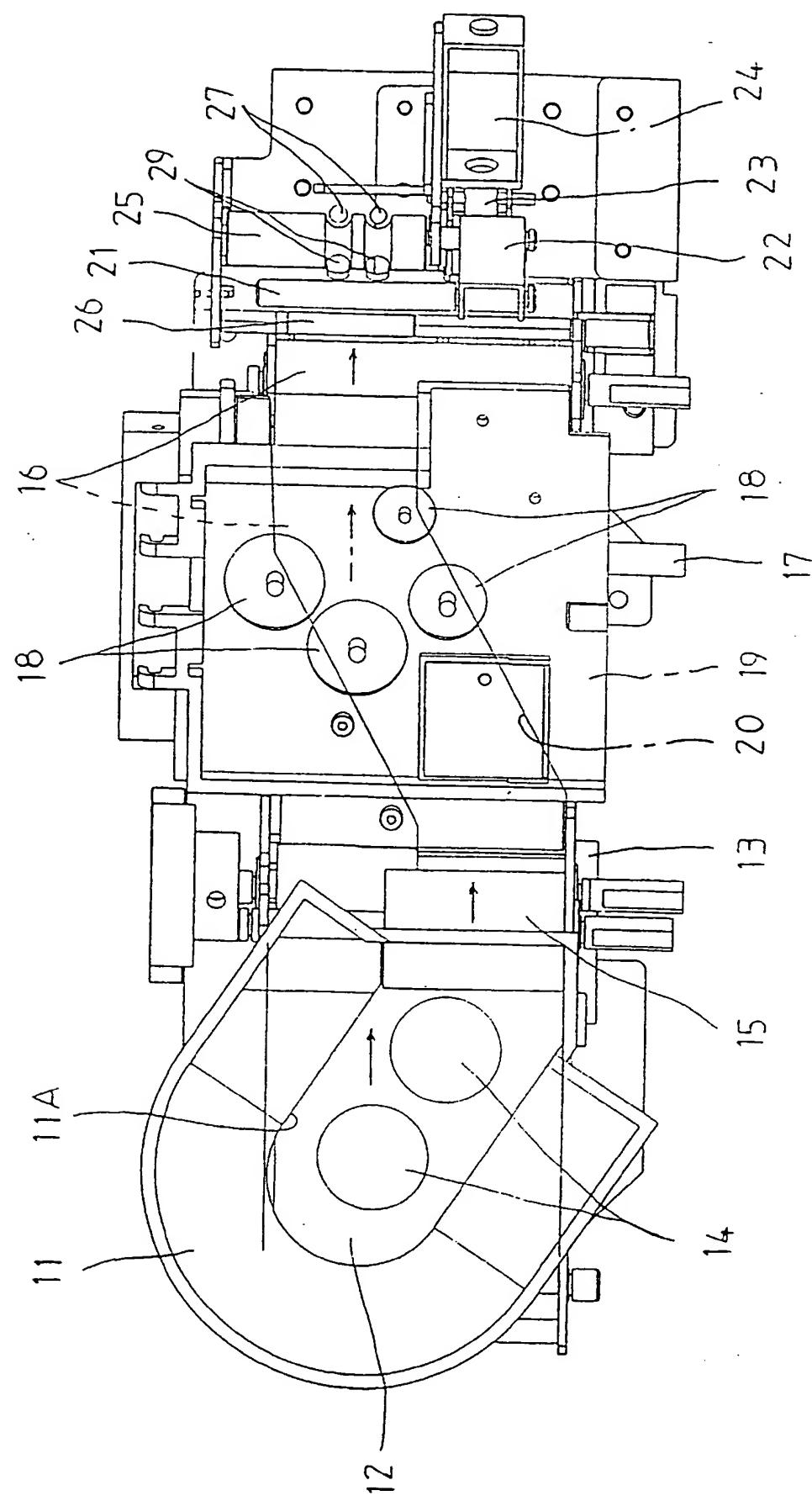


Figure 2

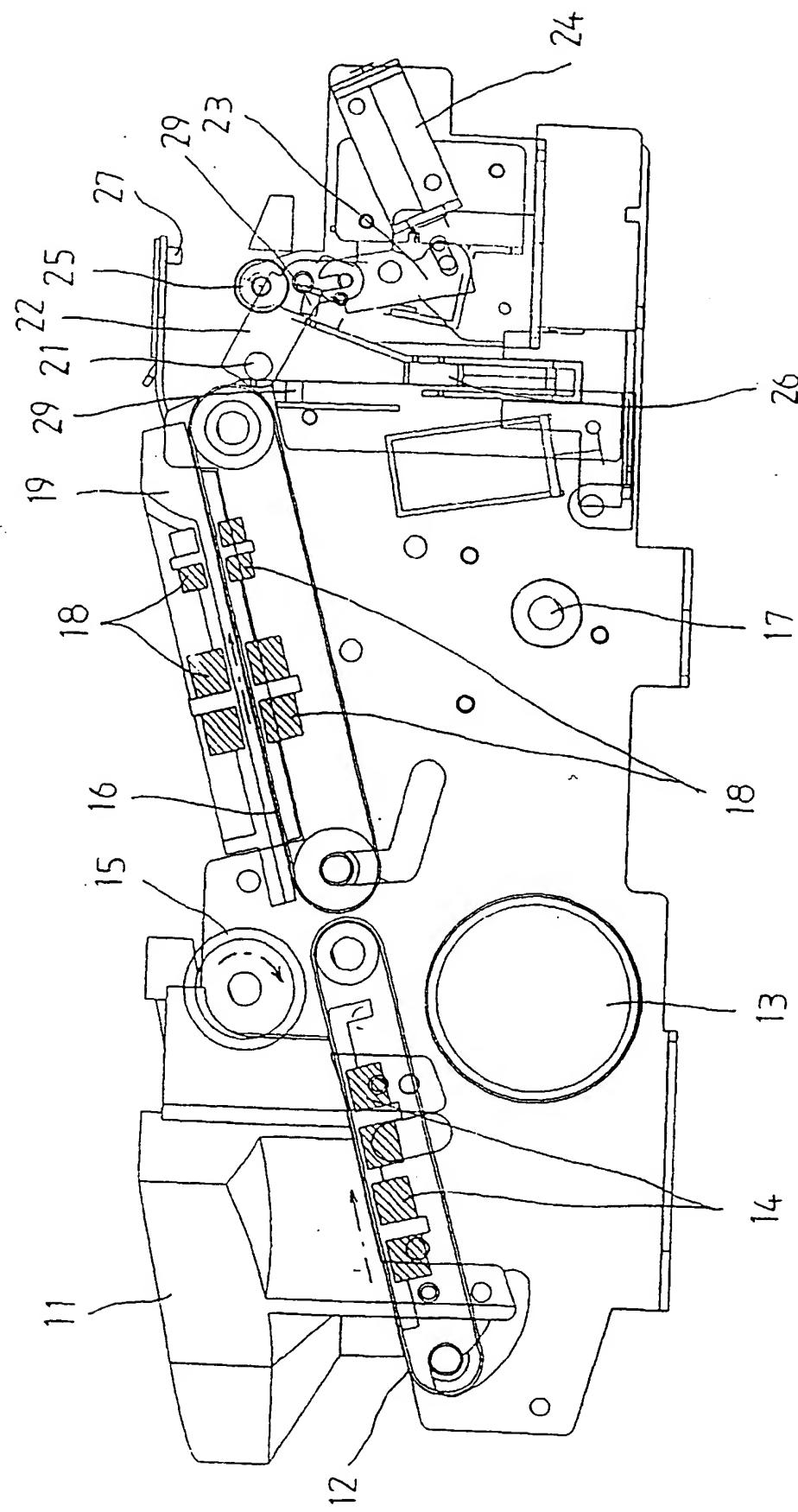


Figure 3

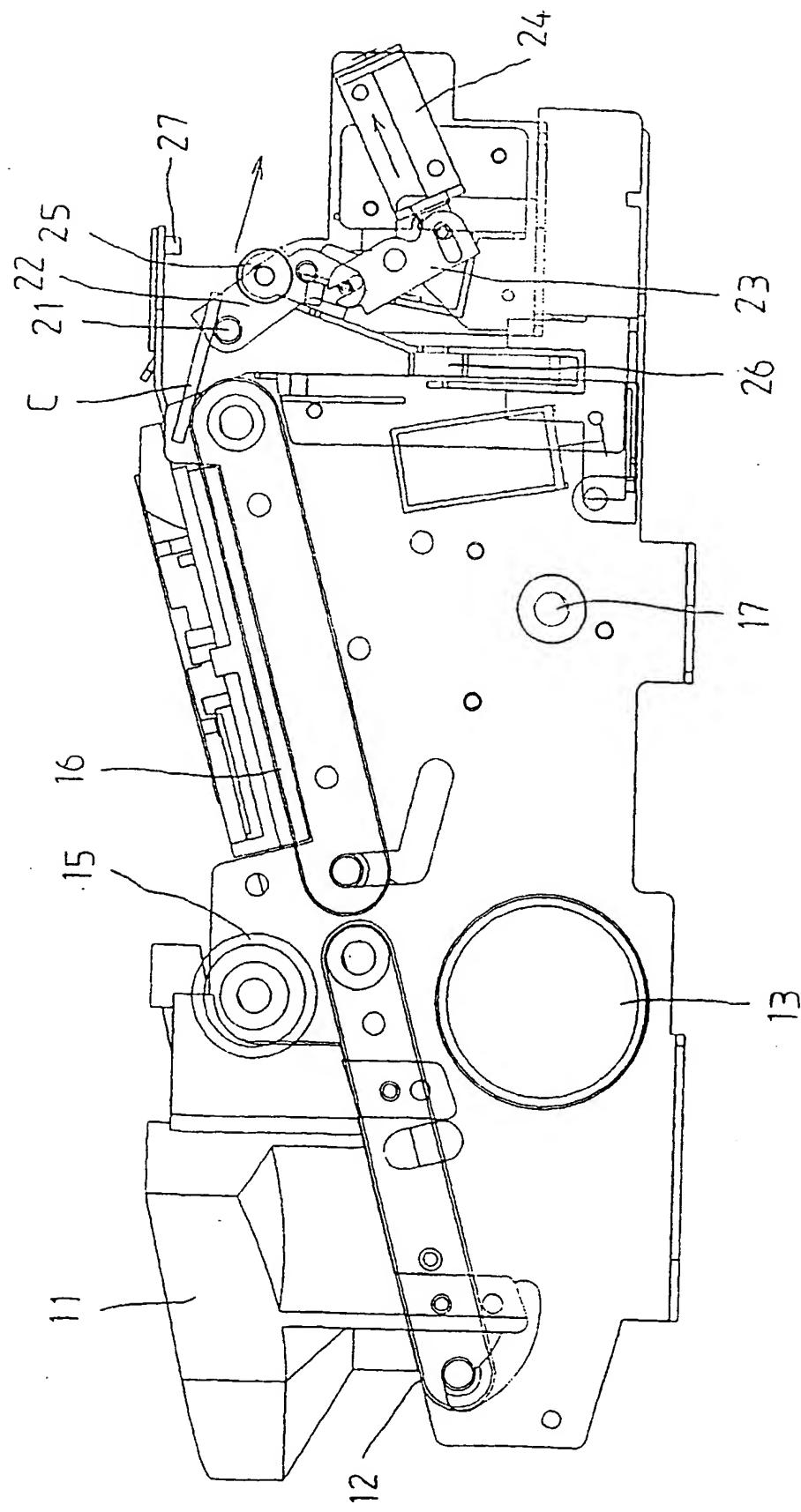


Figure 4

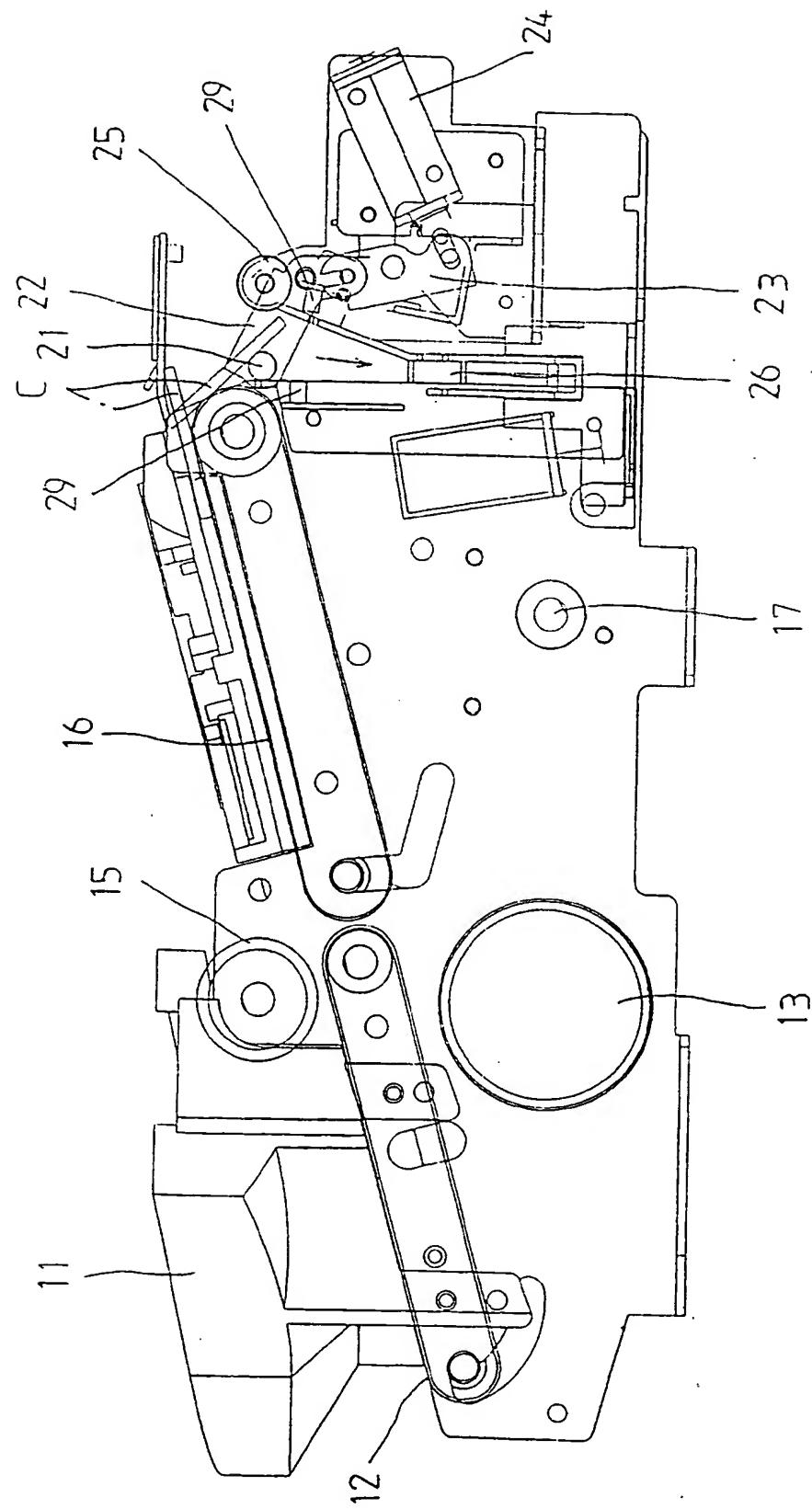


Figure 5

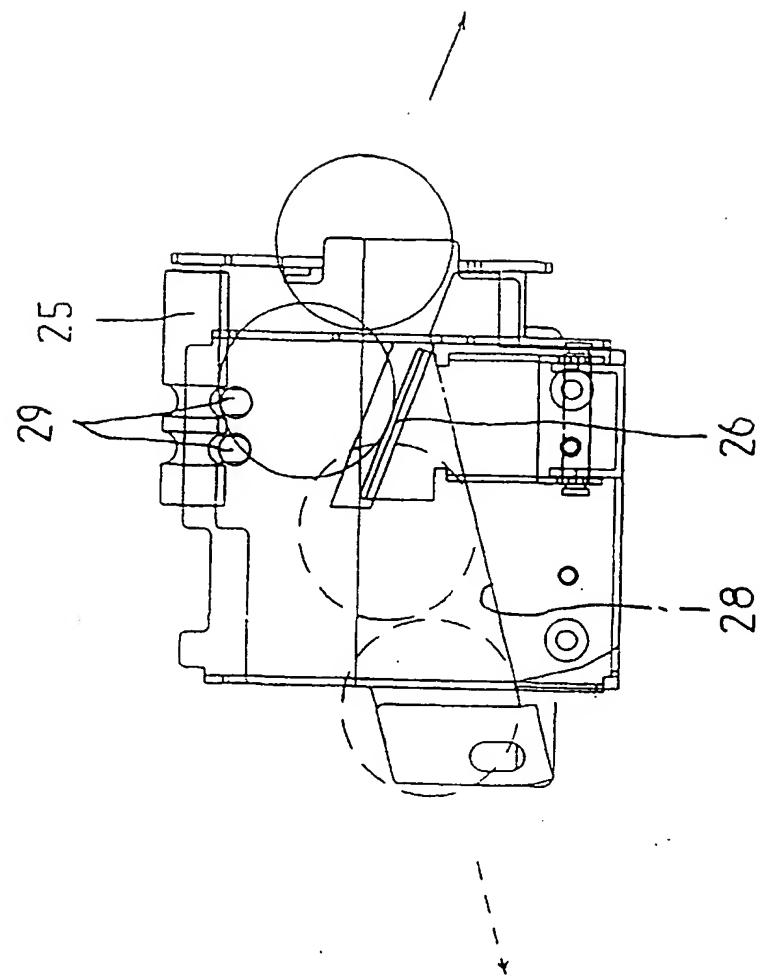
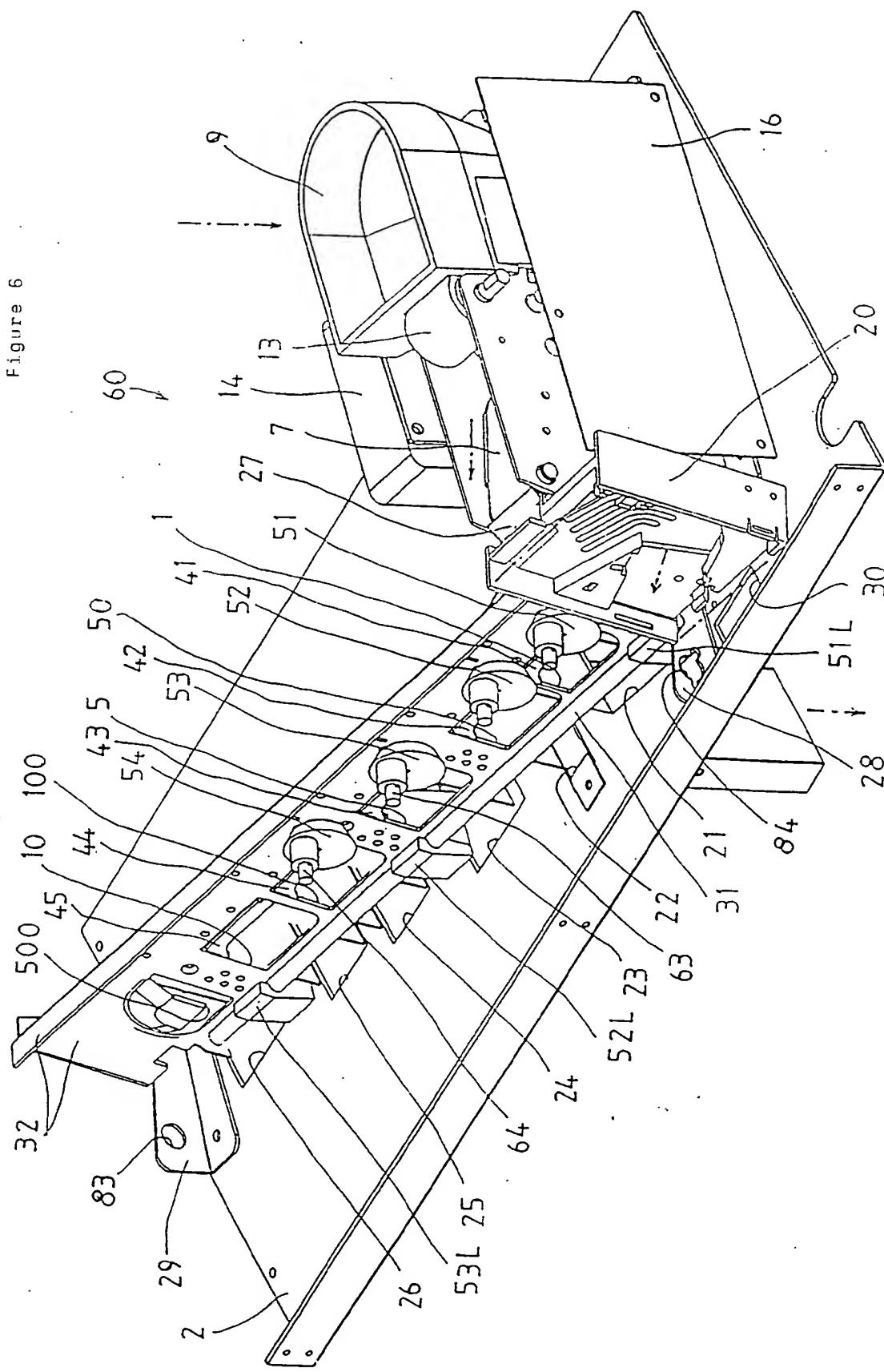


Figure 6





## EUROPEAN SEARCH REPORT

Application Number

EP 99 10 3312

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X	EP 0 481 699 A (UNIVERSAL KK) 22 April 1992	1,2,4	G07D3/14 G07D9/00						
A	* column 1, line 36 - column 2, line 16 * * column 3, line 18 - column 5, line 13 * * claims 1,9; figures 2,4-8 *	3,5							
X	US 4 558 711 A (IKUTA YOSHIAKI ET AL) 17 December 1985	1,2							
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A	US 5 207 611 A (OKITA TATSUO ET AL) 4 May 1993 * abstract * * column 1, line 59 - column 4, line 31 * * figures 1,3-5 *	1-5							
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			G07D						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>17 June 1999</td> <td>Bocage, S</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	THE HAGUE	17 June 1999	Bocage, S
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